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$a_q\,b$=quaternion product of vectors a and b.

$a_g\,b$, or [ab]=Grassmann outer product of vectors a and b.

The writer has found this notation as convenient as the dot and cross. It is commended to the student of vector analysis as practical and as retaining the original Hamilton symbols. Evidently little effort is needed to pass from this to the old S, V, T, U notation. Finally, it is adapted to the needs of the general science of vector analysis and admits freely of the introduction of new products.

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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

167. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

A traveler notices that $m=2\frac{1}{2}$ times the number of spaces between the telegraph poles that he passes in a minute is the rate of the train in miles per hour. How far apart are the poles?

Solution by G. B. M. ZERR, A. M., Ph.D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Let n=number of spaces passed per minute, d=distance between poles.

Then mn miles per hour$=\dfrac{mn\times5280}{60}=88mn$ feet per minute.

$\therefore$ $dn=88mn$, or $d=88m$ feet. When $m=2\frac{1}{2}$, $d=220$ feet.

168. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

If I buy for $m=10\%$ and $n=5\%$ *less* I shall gain $p=15\%$ and $q=5\%$ *more*. What is my rate of gain?

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

This problem is not clear. I interpret it to mean: If I buy for $100\times90\times95=85.5\%$ instead of for 100%, and sell for the same price as I sold when I paid 100%, I would gain $100\times115\times105=120\frac{3}{4}\%$, $-100\%=20\frac{3}{4}\%$ more than I did gain. $85\frac{1}{2}\%=\frac{171}{200}$, $20\frac{3}{4}\%\frac{83}{400}$, $\frac{83}{400}+1=\frac{483}{400}$. $(\frac{483}{400}\times171-200)\div(200-171=(\frac{82593}{400}-200)\div(200-171)=6\frac{193}{400}\div29=\frac{2593}{11600}$, $\frac{2593}{11600}$ of $100\%=22\frac{41}{116}\%$.